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GENETIC PREDICTION FOR BEEF IN UNITED STATES

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SUMMARY

Beef performance programs have come a long way since their start after World War II as a means of within-herd improvement. Now performance programs can be used to rank young animals on all the available information across all the herds of a breed. Opportunity exists to design and conduct performance programs that can be used to promote the breed, enhance management decision making, and make real genetic change in the breed.

INTRODUCTION

The beef industry of the United States is a sprawling, dynamic, and highly segmented industry that encompasses America from border to border and from coast to coast. The adaptability of Brahman cattle to semi-tropical ecosystems has enlarged the scope of the beef industry. The genetic structure of the beef herd in the United States consists of a large commercial segment and a much smaller purebred segment accounting for some 3 to 5% of the national cow herd. Traditionally, the latter segment serves the former by providing the breeding stock. The purebred segment is further subdivided into pedigree isolated sub-groups called breeds. The commercial producer has the opportunity to select the breed or breed combinations to be used in an operation as well as to select the individuals of the breeds for use. The entire structure, both segments, is composed of herds that are privately owned and that vary in size from two cows to thousands of head. During the production cycle, market animals traditionally change hands several times. That is, there are commercial cow-calf operations, stocker operations, and of late giant feedlot operations that finish the market stock for slaughter. Couple this with the infrastructure necessary to move, slaughter and pack, and merchandize the produce, beef, through giant-chain supermarkets and the beef industry is indeed a sprawling giant operating by long term decision making in a volatile short term economic setting. It is simply hard to be a sound economic unit of such an industry. The "romance of the cow" still makes belonging a prestige occupation; boots, hats, and all!

PERFORMANCE HISTORY

Just why beef breeders were slow to adopt performance evaluation is not clearly understood, but the rich heritage of the industry certainly contributed to doing it the way grandfather did. But beef breeding research conducted at the USDA range station in Montana from 1924 on was to change the direction of the beef industry in unforeseen ways. Objective measures of merit in beef cattle were called for as early as 1936. Heritability estimates for growth and weight adjustments stimulated research interests. Three regional beef breeding projects were initiated and beef research began in ernest in 1947. The work of the pioneer researchers was important. These men and those to follow had research herds that gave them a rapport with breeders.

Performance evaluation was started by a handful of breeders, extension men, and researchers on a "one-to-one" basis. From 1940 to 1960, the elite breeders of today developed; they were outside the "in crowd" of the beef world.

Central bull testing began in Texas in 1941. The tests proved to be a successful demonstration of competition based on performance. The gift of

Charolais (King, 1967) in the 1930's clearly showed all breeders, especially in the central tests, that cattle could gain rapidly. The Babcock fat test was the promotional device that moved the dairy industry into recording milk weight and test. The Charolais breed was the "Babcock test" of beef performance recording.

Between 1945 and 1950, extension beef cattle improvement programs (BCI) were started. The first were in California, New Mexico and Montana and were run by extension specialists. In 1955, Virginia organized the first beef cattle improvement association run by breeders with extension help. In the same year, extension leaders gathered the growing number of performance cattlemen together in Texas and formed Performance Registry International (PRI). This organization became the focal point of the industry for performance. A codified program was patterned after the several growing state programs. Set weight standards for certification were used. The real innovation of PRI was the certified meat sire (CMS) program started in 1961. Ten progeny were compared to standards. The program caught the interest of the beef industry.

The growing strength of PRI and the many state associations prompted the British breeds to develop performance programs. By the 1960's, they had illustrated handbooks and were giving performance "lip service" as a within-herd tool.

Close to 80% of the beef was being fed as a result of the Southwestern commercial feedlots. Longtail yearling (OKIES) from the South, were turning more profit than were British steers. With the Charolais becoming the third largest breed and the industry still smarting from dwarfism; larger framed, growthier cattle became the judge's choice by the middle 1960's. To move faster, expert showmen acquired cattle from performance herds. They won. In the Angus breed, at least, this popularized performance cattle and helped move the breed toward performance.

The first meeting was at Kansas City in 1968. It did not use a show as a crutch. Baker was responsible, with help, in establishing this unique organization. BIF published guidelines for uniform beef improvement programs; the updates have become the performance "bible" for the beef industry. At each meeting, a symposium is held in which relevant research is presented. This interface has speeded adoption dramatically. It has stimulated research and thus is synergistic.

After years of academic interest and many dollars on the part of breeders in the U.S., Canada opened the importation of cattle breeds from Continental Europe. Excited breeders and bull studs promoted these newly introduced breeds. The Dutchess Shorthorn Boom of the late 1800's was repeated all over again. Entrepreneurs, who failed to see Charolais and some of them as well, established breed associations that require performance records for registration. Some bull studs developed importation and testing programs. These breeds differed from the traditional British breeds. The industry had "high-priced" germ plasm with no comparative data. One of the first U.S. Meat Animal Research Center beef projects was germ plasm evaluation. At no time have research reports been more widely anticipated, read and then acted on. The "exotic" boom continued until 1974 when the cattle cycle turned down.

One of the working committees of BIF was national sire evaluation. In 1971, guidelines were approved that incorporated the use of reference sires as the basis of comparison of sires. Both field data evaluation by the newly introduced breeds using AI and designed programs for the established breeds were

forthcoming. The American Simmental Association published the first sire summary in 1971. There are now some nine programs (Willham, 1979). Most are descriptive.

In the early 1970's, the British breed associations realized that their major reason for being was their performance programs. The speed with which they have become involved in real performance evaluation has been amazing. Weight breeding values, based on own and relative performance, were introduced to the industry as a part of the computer cow game played by BIF members attending the 1970 meeting. These values were incorporated into breed programs in 1971 and in 1974 maternal breeding values (milk production reflected in the weaning weight of calves of daughters of the sires in the pedigree) were being used. The sophistication of the breed programs coupled with breed-wide national sire evaluation programs have enhanced the position of breed programs and reduced the relevance of PRI and many of the state programs.

BIF is a bit awed by its success. It is a real vehicle by which new breeding technology can be introduced to the leadership of the beef industry. The fact that member organizations keep their own records is important, especially breed associations. Approximately 50% of the calves registered have records in the British breeds while some newly introduced breeds still require records for registration. However, shows remain a powerful promotion tool. Hip height, popularized in Missouri, is used to objectively look at frame size and composition. Tallness is in vogue, while total efficiency in production systems generally is ignored even with the Texas research on beef systems.

The newly introduced breeds have caused the beef industry to use AI more extensively. Systematic crossbreeding is accepted, with about 50% of the producers practicing some crossing. However, crossbreeding still is difficult to manage in some operations. Recent research results have emphasized the matching of genetic potential to resources.

Recently researchers have had the opportunity to study beef field data amassed by several breed associations. Field data from several breeds have been examined for breed-specific correction factors, evidence for sire interactions and other information.

During 1980 and following, both the field data from the American Angus Association and the American Hereford Association have been analyzed using a mixed-model procedure for sire evaluation. The results show a very linear genetic trend for the two breeds over two generations of some 3 pounds per year in yearling weight. From the genetic trend, it appears breeders are capable of making genetic change when given signals by commercial producers, as they were in the middle 1960's (Willham, 1982).

Beef breeds now recognize AI as a breed improvement tool; 89% of the sires are directly or indirectly tied. With these ties and the relationship ties that are created by the inclusion of the relationship matrix, new analysis procedures can be used to evaluate yearling bulls over herds. Performance records were sold initially as a within-herd tool, but soon can be used over herds. It appears the beef industry is poised on the threshold of a new era where the potential for making genetic change is fantastic! It is imperative to give breeders the facts necessary to make correction direction decisions.

CURRENT GENETIC PREDICTION

Today, the reduced animal model (RAM) is being used in several of the major beef breeds to provide predictions of breeding values for several traits of economic importance on all the individuals in the breed. This includes the sires and the dams and all the young animals especially the young prospective sires of the breed. Over 1.5 million equations including those for contemporary groups, sires, and dams are being solved. For weaning weight, this includes both direct and maternal values for each sire and dam. The opportunity to use multiple trait models is being explored as well (Quaas and Pollak, 1980). Providing such predictions of genetic merit that are comparable across all herds of a breed yearly is a reality. The mystique of the breeder is just about gone when each breeder can be furnished with his genetic herd mean for each trait and his genetic and environmental trend over years can be plotted for him. Little remains for "blue sky" promotion except that some breeders can better present their facts to prospective customers than can others.

Several problems still exist with a yearly analysis of breed performance data. The best way to update the evaluation when new herd data is received is one of these problems. Providing the breeder with comparable predictions among his young stock on which selection decisions must be made immediately remains to be worked out. But compared to the already solved problems this one is minute. The simple manipulation of so many predictions is in itself a data base problem. Long lists of animals are costly to provide and difficult to use. Thus, the computer will play another role as a means to provide the breeders with useful lists of available germ plasm in his breed.

FUTURE

To incorporate new germ plasm into a breed, get it effectively evaluated, and then get it adequately utilized based on its evaluation will be an adventure in population genetics. The new germ plasm refers to that created by genetic manipulation of all sorts, even the incorporation of genes from other species. Just what will become propietary and just how current breeders of a breed will fit into the emerging system of delivery to the beef industry remains to be seen.

REFERENCES

Quaas, R. L. and E. J. Pollak. 1980. Mixed model methodology for farm and ranch beef cattle testing programs. J. Anim. Sci. 51:1277.

Willham, R. L. 1978. Evaluation and direction of beef sire evaluation programs. J. Anim. Sci. 49:592.

Willham, R. L. 1982. Genetic improvement of beef cattle in the United States. J. Anim. Sci. 54:659.